<u>Description</u>

This aluminum reduction plant has a capacity of 350,000,000 #/year from 5 pot lines with 120 Soderberg pin type pots per production line. There are 3 major types of operations at the plant. Besides aluminum production, there is a 'Paste Plant' which makes both cathode paste to cement carbon blocks into the cathode and anode briquets for continuous renewal of the pot anodes and a rod mill which casts and rolls aluminum into wire rod.

The alumina for the main operation is shipped to the port of Seattle from Australia and Jamaica and brought to the plant by rail. Considerable amounts of electrical power from several sources in the northwest U.S. are used in the reduction process. The paste plant uses petroleum coke, anthracite coal and pitch (from steel mills) which is brought in by rail from a variety of sources. The cathode carbon blocks are imported from France and are readily available.

Finished product is aluminum in the form of 50 lb. - 6 ton ingots and rod which is used mainly in Anaconda plants (Terre Haute and Atlanta, etc.) which is shipped mainly by rail with some by truck. The plant operates continuously with a total of 1300 employees who are unionized. About 1100 work in the mill on 3 shifts with a minimum shift of 200 men. Turn over is light - plant could be operated by supervisors on a minimal production basis. Maintenance and repair is done by in-house people.

The plant is located on 125 acres of relatively flat land adjacent to the Flathead River.

Layout is good with most of the aluminum production in a single large interconnected complex, however limited combustibility of construction and contents should limit fire loss to minor areas.

The paste mill forms a single fire division and is subject to a single loss. The rod mill also forms a single fire division and is well separated from other plant structures.

Maintenance, care and cleanliness would grade good.

<u>Special Hazards</u>

(See Electrical Section)

Besides electrical, the paste plant presents the greatest loss potential from fire. Involved in this operation is grinding and screening of coal and coke, mixing using pitch and a hot oil heat mechanism system used to keep mixers at 185^{o}C.

The plant is sprinkler protected, and there appears to be very effective control over escape and accumulation of dusts inside the building.

An owned IBM 1800 computer is being installed to control the pot lines and is located in a separate building in the center of the mill. This system can be bypassed to manual control. The computer room is not constantly attended and has no fire detection or fire supression equipment.

There are emergency propane fuel back-up systems located north of the main mill and west of the rod mill. These systems both consist of a single storage tank plus vaporizers and have no fire protection except from yard hydrants.

Special Equipment

The most critical special equipment would be the electrical transformers and rectifiers on the south side of the plant which may take as long as one year to replace. This equipment is well spaced, the rectifier transformers are manual water sprayed and there is quite a bit of flexibility built into power suppliers in the plant.

Utilities

Electrical: Plant demand is high at about 378 megawatts. Power from the extensive northwest grid system enters the plant on 3 main feeder lines at 13.8 K.V. This power is about 90% hydroelectric and 10% nuclear, coal etc. source. The Hungry Hose and Hot Springs feeders connect to one side of the bus and the Libby Noxon feeder connects to the other side with there being a manual connector switch. Only the Hot Springs feeder could carry the entire plant load for any length of time.

Power costs the plant about $1 million/month, is set up on about 92 contracts which specify several types of curtailment.

(1) long term interruption of up to 25% of power
(2) total interruption for short periods of up to 5 minutes
(3) 50% interruption of power for periods of up to 2 hours.

Plant can restart pot lines without damage within a 2 hour period however, after 2 hours, damage to the cells grows more severe until an interruption of over 4 hours would result in a freez-up of the pots and inability to restart.

There is a secondary main 230 KV bus with an air breaker (normally closed) between supply lines to Pot lines #2 and #3. Each rectifier transformer bus can either be switched to a spare feeder or to an adjacent bus. The rectifier transformers are all protected by manual water spray protection with valves just inside the building.

All of the yard transformers and switches are well spaced and there is lots of flexibility in switching around possibly disabled equipment.

Power for the pot lines enters the rectifier building. Lines 1 and 2 have mercury arc units whereas other lines have the diode type rectifiers. Cooling is maintained for lines 1 and 2 by air blown from the basement up through the main floor switch room and the second floor housing the rectifiers. On the diode units, air is blown up from the basement through the frame cabinets then by induced fan to the exterior of the building. The D.C. current for each of the pot lines goes by bus bar to the basement of the pot line buildings where it passes in series through all of the 120 pots before reaching ground. Open cross-over circuits are provided so that not more than 30 pots should be lost at one time in the circuit.

Provisions have been made to bypass each cell as required. Main hazard in the basement is failure of the cell case in which molten metal could do damage to the exposed bus bars, however it is posible to rig around any break without too much delay.

All of the pot lines are electrically controlled and monitored from a control room on the second floor of the rectifier building for lines 1 and 2. An attendant is on duty most of the time. He utilizes a computer to control loads to the cells, however the job can be done manually.

There are no smoke detectors or special extinguishing systems for the rectifier and cell room portions of the electrical system.

A/C power is taken off at aux. power station in both the east and west power yards and then is routed via cables in trays in underground tunnels to substations across the plant.

Ventilation for the tunnels is from a fan house just north of the casting shed and vents at various places into space within the plant. Some smoke detectors have been installed in the tunnels with the goal being to have a unit every 100'. Either smoke or heat will shut down the tunnel vent fans and send an alarm to the control room. There is a plan to train 2 men in use of fresh air masks to enter a smoking tunnel to find the trouble and identify the cable by number. The tunnels drain to a central point, however disposal of water is by a small dry sump. The tunnel cables carry power to motors, controls and annunciator circuits. A fire in a cable tray could result in very serious and prolonged operating problems.

There are 2 diesel engine-driven generators in the boiler house which are sufficient for orderly plant shutdown - lifting anodes, etc.

Oil used in transformers, breakers, switches, etc., is ordinary transformer type and not a special flame retardant material. The oil is stored in 5-10,000 gallon tanks at the west side of each of the two main switch yards. It is filtered and pumped to oil hydrants in the yard for changing oil. Only protection provided is yard hydrants.

<u>Steam</u>: Plant has 2-22,500 #/hr gas/oil fired steam boilers operating at 410#. Normal steam use is 10-12,000 #/hr for space heating, and processing in the paste plant where steam is used to heat pitch, the 6 extruders and keep briquets hot.

Boiler combustion and safety controls are FM accepted and provide for safe operations.

Steam is essential to continued operation of the paste plant and for building heat in winter. Rod Mill has a small 15# automated boiler for hot water.

Air: There are 7 electric motor-driven air compressors supplying air for tools, emergency cooling, and breathing air.

Fuel: Public utility fuel gas is used in the boilers and in the casting furnaces (9 at reduction plant and 6 at rod mill) except for one electrical furnace, and for some building heat.

Fuel backup at the reduction mill consists of one 30,000 gallon propane tank with vaporizers which is capable of sustaining operations for about 3 days. The rod mill has a 12,000 gallon propane fuel tank and vaporizers which could run backup operations for 3-1/2 days with one rod line down. In the event of pipeline fuel failure, rapid arrangements would have to be made because these fuel backup systems are good only for a very limited time. Experience with present supply line has been very good.